The documentation and process conversion measures necessary to comply with this revision shall be completed by 16 Nov 92

INCH-POUND

MIL-S-19500/270E
14 August 1992
SUPERSEDING
MIL-S-19500/270D
21 May 1981

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, UNITIZED, DUAL-TRANSISTOR, NPN, SILICON, TYPES 2N2060 AND 2N2060L JANTX, JANTXV, AND JANS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for two electrically isolated, matched NPN, silicon transistors as one dual unit. Three levels of product assurance are provided for each device type as specified in MIL-S-19500.

1.2 Physical dimensions. See figure 1.

1.3 Maximum ratings.

P_{T1} T_A = +25°C		P_{T2} T_C = +25°C		I_C	V_{CBO}	V_{CEO}	V_{EBO}	T_{STG} and T_J
One section 1/	Both sections 2/	One section 1/	Both sections 2/					
mW	mW	W	W	mA dc	V dc	V dc	V dc	°C
540	600	1.5	2.12	500	100	60	7	-65 to +200

1/ For T_A > +25°C, derate linearly 3.08 mW/°C one section, 3.48 mW/°C both sections.
2/ For T_C > +25°C, derate linearly 8.6 mW/°C one section, 12.1 mW/°C both sections.

1.4 Primary electrical characteristics at T_A = +25°C.

	h_{FE1}	h_{FE2}	h_{FE3}	h_{FE4} 1/	$\|h_{FE}\|$	$V_{CE(sat)}$	$V_{BE(sat)}$
Limit	V_{CE} = 5 V dc I_C = 10 µA dc	V_{CE} = 5 V dc I_C = 100 µA dc	V_{CE} = 5 V dc I_C = 1 mA dc	V_{CE} = 5 V dc I_C = 10 mA dc	V_{CE} = 10 V dc I_B = 50 mA dc f = 20 MHz	I_C = 50 mA dc I_B = 5 mA dc	I_C = 50 mA dc I_B = 5 mA dc
						V dc	V dc
Min	25	30	40	50	3	---	---
Max	75	90	120	150	25	0.3	0.9

1/ Pulsed (see 4.5.1).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Defense Electronics Supply Center, ATTN: DESC-ECT, 1507 Wilmington Pike, Dayton, OH 45444-5280 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5961

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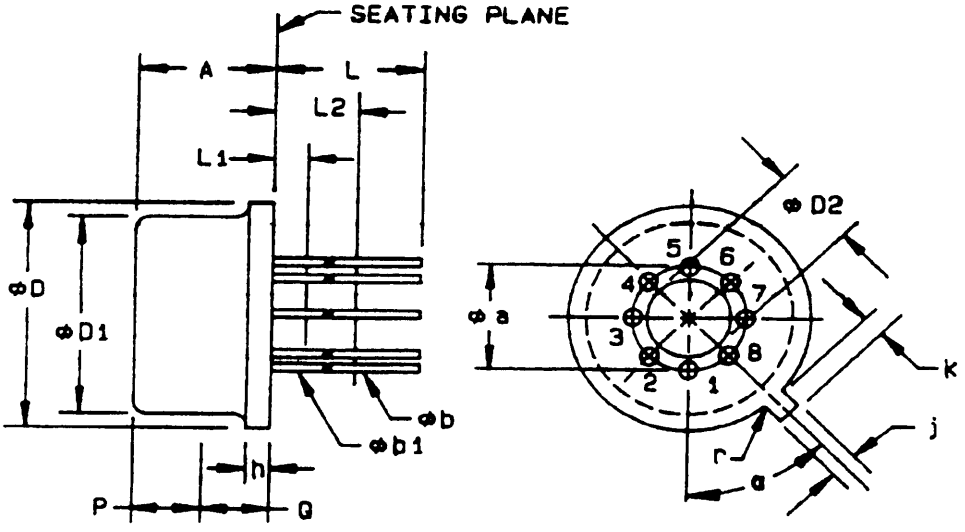

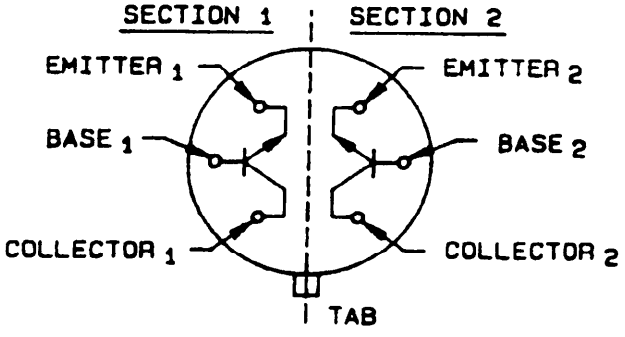

CONNECTION DIAGRAM

FIGURE 1. Physical dimensions.

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
ϕa	.200 TP		5.08 TP		9
A	.150	.260	3.81	7.60	
ϕb	.016	.021	0.41	0.53	10
ϕb_1	.016	.019	0.41	0.48	10
ϕD	.335	.370	8.51	9.40	
ϕD_1	.305	.335	7.75	8.51	
ϕD_2	.140	.160	3.56	4.06	
h	.009	.041	0.23	1.04	
j	.028	.034	0.71	0.86	4,5
k	.029	.045	0.74	1.14	5,6
L	See notes 10, 12, and 13				
L_1	----	.050	----	1.27	10
L_2	.250	----	6.35	----	10
P	.100	----	2.54	----	8
Q	----	.050	----	1.27	7
r	----	.010	----	0.25	11
α	45° TP		45°TP		9

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only and are based upon 1.00 inch = 25.4 mm.
3. Refer to rules for dimensioning semiconductor product outlines included in Publication No. 95.
4. Lead number 4 and 8 omitted on this variation.
5. Beyond r, j must be held to a minimum length of .021 inch (.53 mm).
6. k measured from maximum ϕD.
7. Details of outline in this zone optional.
8. ϕD_1 shall not vary more than .010 inch (.25 mm) in zone P. This zone is controlled for automatic handling.
9. Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 inch (.18 mm) radius of true position (TP) at a maximum material condition (MMC) relative to the tab at MMC. The device may be measured by direct methods or by the gauge and gauging procedure described on gauge drawing GS-1.
10. ϕb_1 applies between L_1 and L_2. ϕb applies between L_2 and L minimum. Diameter is uncontrolled in L_1 and beyond minimum.
11. r (radius) applies to both inside corners of tab.
12. For transistor types 2N2060, L is .500 inch (12.70 mm) minimum, and .750 inch (19.50 mm) maximum. (TO-99)
13. For transistor types 2N2060L, L is 1.500 inches (38.10 mm) minimum, and 1.750 inches (44.45 mm) maximum.

FIGURE 1. Physical dimensions - Continued.

1.5 Primary electrical matching characteristics of each individual section.

Limit	$\frac{h_{FE2-1}}{h_{FE2-2}}$ 1/	$\lvert V_{BE1} - V_{BE2} \rvert$	$\lvert \Delta(V_{BE1} - V_{BE2})\ \Delta T_A \rvert 1$	$\lvert \Delta(V_{BE1} - V_{BE2})\ \Delta T_A \rvert 2$
	V_{CE} = 5 V dc; I_C = 100 µA dc; 1/	V_{CE} = 5 V dc; I_C = 100 µA dc	V_{CE} = 5 V dc; I_C = 100 µA dc; T_A = +25°C and -55°C	V_{CE} = 5 V dc; I_C = 100 µA dc; T_A = +125°C and +25°C
		mV dc	mV dc	mV dc
Minimum	0.9	---	---	---
Maximum	1.0	5	0.8	1.0

1/ The larger number will be placed in the denominator.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks from a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

MILITARY

MIL-S-19500 - Semiconductor Devices, General Specification for.

STANDARDS

MILITARY

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Associated detail specification. The individual item requirements shall be in accordance with MIL-S-19500 and as specified herein.

3.2 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein shall be as specified in MIL-S-19500 and as follows:

$\frac{h_{FE-1}}{h_{FE-2}}$ - Static forward-current-gain-ratio. The matching ratio of the static forward-current transfer ratios of each section.

$\lvert V_{BE1} - V_{BE2} \rvert$ - - - - - - - - - - - - - - - - - Absolute value of base-emitter-voltage differential between the individual sections.

$\lvert \Delta(V_{BE1} - V_{BE2})\ \Delta T_A \rvert$ - - - - - - - - - - - - Absolute value of the algebraic difference between the base-emitter-voltage differentials between the individual sections at two different temperatures.

3.3 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-S-19500 and on figure 1 herein.

3.3.1 Lead finish. Lead finish shall be gold, silver, tin, or solder plated. Lead finish shall be solderable as defined in MIL-S-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition requirements (see 6.2).

3.4 Marking. Marking shall be in accordance with MIL-S-19500. At the option of the manufacturer, marking of the country of origin may be omitted from the body of the transistor, but shall be retained on the initial container.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500, and as specified herein.

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-S-19500.

4.3 Screening (JANS, JANTXV, and JANTX levels only). Screening shall be in accordance with table II of MIL-S-19500 and as specified herein. The following measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen (see table II of MIL-S-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
9	I_{CBO1}, $\frac{h_{FE2-1}}{h_{FE2-2}}$, and h_{FE3}	Not applicable
11	I_{CBO1}, $\frac{h_{FE2-1}}{h_{FE2-2}}$, and h_{FE3} I_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater. Δh_{FE3} = ±15 percent	I_{CBO1} and h_{FE3}
12	See 4.3.1	See 4.3.1
13 (a)	Subgroups 2 and 3 of table I herein; ΔI_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater; Δh_{FE3} = ±15 percent	Subgroup 2 of table I herein, ΔI_{CBO1} = 100 percent of initial value or 2 nA dc, whichever is greater; Δh_{FE3} = ±15 percent
13 (b)	MIL-STD-750, method 1016, test condition A (collector to collector, $R_{C1-C2} = 10^9$ ohms minimum.	Not applicable

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows:

JANS level (all device types) - - - - V_{CB} = 10 V dc, P_T = 300 mW (each section) at T_A = +25°C ±3°C.
V_{CB} = 10 V dc, P_T = 600 mW (both sections) at T_A = +25°C ±3°C.

JANTX and JANTXV levels
(all device types) - - - - - - - - V_{CB} = 40 V dc, P_T = 300 mW (each section) at T_A = +25°C ±3°C.
V_{CB} = 40 V dc, P_T = 600 mW (both sections) at T_A = +25°C ±3°C.

NOTE: No heat sink or forced air cooling on the devices shall be permitted.

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-S-19500.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with MIL-S-19500 and table I herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table IVa (JANS) and table IVb (JAN, JANTX and JANTXV) of MIL-S-19500. Electrical measurements (end points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.2.1 Group B inspection, table IVa (JANS) of MIL-S-19500.

a. Condition for intermittent operation life are as follows:

V_{CB} = 10 V dc; P_T = 300 mW (each section); P_T = 600 mW (both sections) at T_A = +25°C ±3°C; $t_{on} = t_{off}$ = 3 minutes minimum for 2,000 cycles. No heat sink or forced-air cooling on devices shall be permitted.

b. Condition for steady-state operation life (accelerated) are as follows:

V_{CB} = 10 V dc; P_T = 300 mW (each section); P_T = 600 mW (both sections) at T_A = +100°C ± for 96 hours or T_A = +125°C ±25°C for 96 hours with P_T adjusted according to the chosen T_A to give an average T_J = +275°C.

4.4.2.2 Group B inspection, table IVb (JANTX and JANTXV of MIL-S-19500. Condition for Steady-state operation life (accelerated) are as follows:

V_{CB} = 30 V dc; P_T = 300 mW (each section); P_T = 600 mW (both sections) at T_A = +25°C ±3°C. No heat sink or forced-air cooling on the devices shall be permitted.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table V of MIL-S-19500. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.3.1 Group C inspection, table V of MIL-S-19500. Condition for steady-state operation life (accelerated) are as follows:

1000 hours at V_{CB} = 30 V dc; P_T = 300 mW (each section); P_T = 600 mW (both section) at T_A = +25°C ±3°C. No heat sink or forced-air cooling on device shall be permitted.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

4.5.2 Testing of units. All specified electrical tests, including electrical measurements (end points) and delta requirement tests, shall be performed equally on both sections of the transistor types covered herein, except where the electrical characteristic being evaluated applies to the transistor as a device entity.

4.5.3 Disposition of leads when testing characteristics of each section. During the measurement of the characteristic of each section, the leads of the section not under test shall be open-circuited.

4.5.4 Forward-current-gain ratio. The value for the forward-current-gain ratio for each individual section of a dual unit shall be measured using method 3076 of MIL-STD-750. The forward-current-gain ratio shall be calculated by dividing one of the values by the other. If possible, this ratio shall be measured directly to improve accuracy.

4.5.5 Base-emitter-voltage differential. The base-emitter-voltage differential shall be determined by connecting the emitters of the individual sections together, applying specified electrical test conditions to each individual section in accordance with test condition B, method 3066 of MIL-STD-750, and measuring the absolute value of the voltage between the bases of the individual sections of a dual unit.

4.5.6 Base-emitter-voltage differential change with temperature. The value of the base-emitter-voltage differential shall be measured at the two specified temperatures in accordance with 4.5.5 except that the identities of the individual sections shall be maintained. The absolute value of the algebraic difference between the values at the two temperature extremes shall be calculated. A mathematical formula for this parameter is:

$$\left| (V_{BE1} - V_{BE2})_{T1} - (V_{BE1} - V_{BE2})_{T2} \right|$$

4.5.7 Noise figure test. Noise figure shall be measured using a model No. 2173C/2181 Quan Tech Laboratories test set, or equivalent. Conditions shall be as specified in table I.

4.5.8 Noise figure (wideband) test. Wideband noise figure shall be measured using a model No. 512 Quan Tech Laboratories test set, or equivalent. Conditions shall be as specified in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-S-19500.

6. NOTES

6.1 Notes.

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Issue of DODISS to be cited in the solicitation.

b. Lead finish (see 3.3.1).

c. Product assurance level and type designation.

6.3 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

TABLE I. Group A inspection.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 1						
Visual and mechanical examination	2071					
Subgroup 2						
Breakdown voltage, collector to base	3001	Bias condition D, I_C = 100 µA dc	$V_{(BR)CBO}$	100		V dc
Breakdown voltage, collector to emitter	3011	Bias condition B, I_C = 100 mA dc R_{BE} ≤ 10 ohms, pulsed (see 4.5.1)	$V_{(BR)CER}$	80		V dc
Breakdown voltage, collector to emitter	3011	Bias condition D, I_C = 30 mA dc pulsed (see 4.5.1)	$V_{(BR)CEO}$	60		V dc
Breakdown voltage, emitter to base	3026	Bias condition D, I_E = 100 µA dc	$V_{(BR)EBO}$	7		V dc
Collector to base cutoff current	3036	Bias condition D, V_{CB} = 80 V dc	I_{CBO1}		2	nA dc
Emitter to base cutoff current	3061	Bias condition D, V_{EB} = 5 V dc	I_{EBO}		2	nA dc
Saturation voltage and resistance (collector to emitter)	3071	I_C = 50 mA dc; I_B = 5 mA dc	$V_{CE(sat)}$		0.3	V dc
Base emitter voltage (saturated)	3066	Test condition A; I_C = 50 mA dc; I_B = 5 mA dc	$V_{BE(sat)}$		0.9	V dc
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 µA dc	h_{FE1}	25	75	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 100 µA dc	h_{FE2}	30	90	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	h_{FE3}	40	120	
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 mA dc pulsed (see 4.5.1)	h_{FE4}	50	150	
Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 100 µA dc pulsed (see 4.5.4)	h_{FE2-1} / h_{FE2-2} 2/	0.9	1.0	
Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 1 mA dc pulsed (see 4.5.4)	h_{FE3-1} / h_{FE3-2} 2/	0.9	1.0	

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 2 - Con't						
Absolute value of base-emitter-voltage differential	3066	Test condition B; V_{CE} = 5 V dc; I_C = 100 µA dc (see 4.5.5)	$\lvert V_{BE} - V_{BE2} \rvert$ 1		5	mV dc
Absolute value of base-emitter-voltage differential	3066	Test condition B; V_{CE} = 5 V dc; I_C = 1 mA dc (see 4.5.5)	$\lvert V_{BE} - V_{BE2} \rvert$ 2		5	mV dc
Base-emitter-voltage (nonsaturated) (absolute value of differential change with temperature)	3066	Test condition B; V_{CE} = 5 V dc; I_C = 100 µA dc; T_A = +25°C and -55°C (see 4.5.6)	$\lvert \Delta(V_{BE1} - V_{BE2}) / \Delta T_A \rvert$ 1		0.8	mV dc
Base-emitter-voltage (nonsaturated) (absolute value of differential change with temperature)	3066	Test condition B; V_{CE} = 5 V dc; I_C = 100 µA dc; T_A = +25°C and +125°C (see 4.5.6)	$\lvert \Delta(V_{BE1} - V_{BE2}) / \Delta T_A \rvert$ 2		1	mV dc
Subgroup 3						
High temperature operation:		T_A = +150°C				
Collector to base cutoff current	3036	Bias condition D, V_{CB} = 80 V dc	I_{CBO2}		10	µA dc
Low-temperature operation:		T_A = -55°C				
Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 100 µA dc	h_{FE5}	10		
Subgroup 4						
Small-signal short-circuit forward current transfer ratio	3206	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{fe}	50	150	
Common emitter small-signal-short-circuit forward-current transfer ratio	3306	V_{CE} = 10 V dc; I_C = 50 mA dc; f = 20 MHz	$\lvert h_{FE} \rvert$	3	25	
Small-signal short-circuit input impedance	3201	V_{CB} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{ib}	20	30	ohms

See footnotes at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
Subgroup 4 - Con't						
Small-signal short-circuit input impedance	3201	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{ie}	1000	4000	ohms
Small-signal open-circuit output admittance	3216	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{oe}	0	16	µmhos
Output capacitance (input open circuited)	3236	V_{CB} = 10 V dc; I_E = 0; 100 kHz ≤ f ≤ 1 MHz	C_{obo}		15	pF
Input capacitance (output open circuited)	3240	V_{EB} = 0.5 V dc; I_C = 0; 100 kHz ≤ f ≤ 1 MHz	C_{ibo}		85	pF
Noise figure	3246	V_{CE} = 10 V dc; I_C = 300 µA dc; R_g = 510 Ω; f = 1 kHz (see 4.5.7)	F1		8	dB
Noise figure	3246	V_{CE} = 10 V dc; I_C = 300 µA dc; R_g = 1 kΩ; f = 10 kHz (see 4.5.7)	F2		8	dB
Collector to collector leakage		Test condition (see 4.5.3) $V_{(collector\ 1\ to\ collector\ 2)}$ = 100 V dc	$I_{(collector\ 1\ to\ collector\ 2)}$		100	nA dc

1/ For sampling plan, see MIL-S-19500.

2/ The larger number will be placed in the denominator.

TABLE II. Groups B and C electrical measurements.

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1	Collector to base cutoff current	3036	Bias condition D; V_{CB} = 80 V dc	I_{CBO1}		2	nA dc
2	Collector to base cutoff current	3036	Bias condition D; V_{CB} = 80 V dc	I_{CBO1}		4	nA dc
3	Emitter to base cutoff current	3061	Bias condition D; V_{EB} = 5 V dc	I_{EBO}		2	nA dc
4	Base emitter voltage (absolute value of (differential)	3066	Test condition B; V_{CE} = 5 V dc, I_C = 100 µA dc, (see 4.5.5)	$\lvert V_{BE1} - V_{BE2} \rvert$ 3		8	mV dc
5	Saturation voltage and resistance (collector to emitter voltage)	3071	I_C = 50 mA dc; I_B = 5 V dc	$V_{CE(sat)}$		0.3	V dc
6	Base to emitter voltage (saturated)	3066	Test condition A; I_C = 50 mA dc, I_B = 5 mA dc	$V_{BE(sat)}$		0.9	V dc
7	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 µA dc	h_{FE1}	25	75	
8	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	h_{FE3}	40	120	
9	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 mA dc, pulsed (see 4.5.1)	h_{FE4}	50	150	
10	Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 100 µA dc, (see 4.5.4)	$\frac{h_{FE2-1}}{h_{FE2-2}}$ 1/	0.9	1.0	
11	Forward-current transfer ratio (gain ratio)	3076	V_{CE} = 5 V dc; I_C = 1 mA dc, (see 4.5.4)	$\frac{h_{FE3-1}}{h_{FE3-2}}$ 1/	0.85	1.0	
12	Base emitter voltage (nonsaturated) (absolute value of differential - change with temperature)	3066	Test condition B; V_{CE} = 5 V dc, I_C = 100 µA dc, T_A = +25°C and -55°C, (see 4.5.6)	$\lvert \Delta(V_{BE1} - V_{BE2})\Delta T_A \rvert$ 2		0.80	mV dc
13	Base emitter voltage (nonsaturated) (absolute value of differential - change with temperature)	3066	Test condition B; V_{CE} = 5 V dc, I_C = 100 µA dc, T_A = +25°C and +125°C, (see 4.5.6)	$\lvert \Delta(V_{BE1} - V_{BE2})\Delta T_A \rvert$ 2		1.0	mV dc

See footnotes at end of table.

TABLE II. Groups B and C electrical measurements - Continued.

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
14	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 1 mA dc	Δh_{FE3} 2/	±25 percent change from initial reading		
15	Forward-current transfer ratio	3076	V_{CE} = 5 V dc; I_C = 10 mA dc (see 4.5.2)	Δh_{FE4} 2/	±25 percent change from initial reading		
16	Collector to base cutoff current	3036	Bias condition D V_{CB} = 80 V dc	ΔI_{CBO1} 2/	100 percent or 2 nA dc, whichever is greater.		
17	Saturation voltage and resistance (collector to emitter voltage)	3071	I_C = 50 mA dc I_B = 5 mA dc	$\Delta V_{CE(sat)}$ 2/	±50 percent mV dc from initial reading		

1/ The larger number will be placed in the denominator.

2/ Devices which exceed the group A limits for this test shall not be accepted.

3/ The electrical measurements for table IVa (JANS) of MIL-S-19500 are as follows:

a. Subgroup 3, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, and 11.

b. Subgroup 4, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, and 17.

c. Subgroup 5, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, and 16.

4/ The electrical measurements for table IVb (JANTX and JANTXV) of MIL-S-19500 are as follows:

a. Subgroup 2, see table II herein, steps 1, 5, and 6.

b. Subgroup 3, see table II herein, steps 2, 4, 11, 15, and 16.

c. Subgroup 6, see table II herein, steps 2, 4, 11, and 16.

5/ The electrical measurements for table V of MIL-S-19500 are as follows:

a. Subgroup 2 and 3, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, and 11 for JANS and steps 1, 5, and 6 for JANTX and JANTXV.

b. Subgroup 6, see table II herein, steps 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, and 16 for JANS and steps 2, 4, 11, 15, and 16 for JANTX and JANTXV.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 17
NASA - NA

Review activities:
Army - AR, MI
Air Force - 11, 85
DLA - ES
NASA - LRC, MSF

User activities:
Army - AV, SM
Navy - AS, CG, MC, OS, SH
Air Force - 13, 15, 19

Preparing activity:
Navy - EC

Agent:
DLA - ES

(Project 5961-1378)